The author concludes by proposing methods by which the inquiry should in future be conducted, so as to obviate or eliminate this source of error. Such an inquiry, he remarks, would, by exhibiting the magnetic and diamagnetic powers under new aspects, lead, in all probability, to important consequences.

March 18, 1847.

The MARQUIS OF NORTHAMPTON, President, in the Chair.

J. R. Christie, Esq. and Thomas Webster, Esq. were elected into the Society.

"Researches to determine the Number of Species and the Mode of Development of the British Triton." By J. Higginbottom, Esq., F.R.C.S. Communicated by Thomas Bell, Esq., F.R.S.

The observations of the author, of which he gives a detailed account in the present memoir, have led him to the following conclusions:—

Two species only of the genus Triton are met with in England; namely, the *Triton verrucosus* and the *Lisso-triton punctatus*. It is three years before the animal is capable of propagating its species, and four years before it attains its full growth. In its tadpole state, it remains in the water till its legs acquire sufficient strength to qualify it for progressive motion on land. While a land animal, it is in an active state during the summer, and passes the winter in a state of hybernation; but does not then, as has been erroneously supposed, remain at the bottom of pools. Very dry, or very wet situations are incompatible with the preservation of life during the period of hybernation. At the expiration of the third year, the triton revisits the water, in the spring season, for the purposes of reproduction, and again leaves it at the commencement of autumn. Impregnation is accomplished through the medium of water, and not by actual contact. The growth and development of the triton are materially influenced by temperature, and but little by the action of light. The triton possesses the power of reproducing its lost limbs, provided the temperature be within the limits of 58° and 75° Fahrenheit; but at lower temperatures, and during the winter, it has no such power.

April 15, 1847.

The MARQUIS OF NORTHAMPTON, President, in the Chair.

William Baly, M.D., Thomas Flower Ellis, Esq., John Gorham Maitland, Esq., and W. H. C. Plowden, Esq. were elected into the Society.

"On the Proper Motion of the Solar System." By Thomas Galloway, Esq., A.M., F.R.S.

The object of this paper is to communicate the results of a calculation for determining the direction of the proper motion of the solar system from the apparent proper motions of stars in the southern hemisphere, deduced mostly from a comparison of the observations made by Lacaille at the Cape, about the middle of the last century, with the recent observations of Mr. Johnson and the late Professor Henderson at St. Helena and the Cape respectively. After adverting to the papers of Sir William Herschel in the Philosophical Transactions for 1783 and 1805, and some other investigations of the same subject, the author remarks that up to a recent period astronomers seem generally to have entertained the opinion that our knowledge of the proper motions of the stars is not sufficiently advanced to enable us to pronounce positively either on the fact or the direction of the motion of our own system. This opinion was grounded on the discrepancies which present themselves when it is attempted to explain the observed displacements of individual stars by referring them to the motion of the sun in an opposite direction; it being always found that whatever direction is assigned to the sun's motion, there are many stars whose proper motions cannot thereby be accounted for. But if the sun be in motion it is very improbable that any star is absolutely at rest; hence the proper motions deduced from a comparison of catalogues must be regarded as the effect partly of the true proper motions of the stars, and partly of the apparent systematic or parallactic motion caused by the displacement of the point of view; and as we have no reason for supposing the true proper motion of a star to be more probable in one direction than in another, it may be expected, *à priori*, that the observed directions will form angles of all different values with the direction of the sun's motion, or any other fixed line. The observed discrepancies are therefore not incompatible with a general drifting of the stars towards a particular region of the heavens; but in order to deduce the direction of the systematic motion, it becomes necessary to take account of a very considerable number of proper motions, and to represent them by equations, involving the unknown quantities required for determining the direction of the sun's motion, and to solve the equations so as to obtain the most probable values of those quantities. The first person who investigated the subject under this point of view was Professor Argelander of Bonn, in a paper published in the Petersburg Memoirs for 1837. From the proper motions of 390 stars deduced from a comparison of Bessel's catalogue of Bradley's observations with his own catalogue of stars observed at Abo, Argelander found the direction of the sun's motion, for 1792·5, to be towards the point of the sphere whose right ascension is $259° 47'·6$ and declination $+32° 29'·5$. Lundahl, subsequently, from a comparison of the places of 147 stars in the catalogues of Bessel and Pond, and not included among those considered by Argelander, found the co-ordinates of the point to be Æ$=252° 24'·4$, Dec. $+14° 26'·1$; and Otto Struve,

still more recently, from the comparison of about 400 of Bradley's stars with the positions determined at the Dorpat Observatory, obtained the result Æ$=261^\circ\ 23'\cdot1$, Dec.$+37^\circ\ 35'\cdot7$. The mean of those results taken with respect to their probable errors, was found by O. Struve to be Æ$=259^\circ\ 9'\cdot4$, Dec.$+34^\circ\ 36'\cdot5$.

All the stars included in the calculations of Argelander, Lundahl, and O. Struve being situated to the north of the tropic of Capricorn, it appeared to be a point of some interest to determine whether the southern stars agree with the northern in their indication of the direction of the solar motion, or afford any confirmation of the hypothesis of the sun's translation. Unfortunately, we have no observations made in the southern hemisphere in the last century equal in precision to those of Bradley, but the catalogue given by Lacaille in his 'Astronomiæ Fundamenta,' furnishes a means of comparison of considerable value in reference to the present inquiry. In Mr. Johnson's 'Catalogue of 606 Stars in the Southern Hemisphere' (London, 1835), there are sixty-one which, on comparing their places in 1830 with those of Lacaille reduced to the same epoch, appear to have shifted their positions not less than $8''$ in space in the interval of eighty years between the epochs of the catalogues, or to have an annual proper motion of not less than one-tenth of a second in space. Prof. Henderson's catalogue (Mem. R. Astron. Society, vols. x. and xv.) furnishes thirty-six stars, which, on a like comparison, appear to have an annual proper motion exceeding the same limit. Of these, however, thirty-two are contained in Mr. Johnson's catalogue, but Henderson gives the proper motions of sixteen other stars (in the southern hemisphere), from the comparison of his own places with those of Bradley. On the whole, therefore, the two catalogues furnish eighty-one different stars whose proper motions are given both in right ascension and declination. The method of investigation is the same as that of Argelander. From the differences of Æ and Dec. given by comparison of the catalogues, the direction of the *apparent* motion of each star is computed. It is then assumed that the sun is moving towards a point whose right ascension $A=259^\circ\ 46'\cdot2$ and declination $D=+32^\circ\ 29'\cdot6$; and the direction in which each star would appear to move, if it were itself at rest, is computed on this hypothesis. The difference of these two directions is treated as an error of observation, and its numerical value substituted for the differential of the angle which determines the direction of the parallactic motion; this differential being expressed by a formula containing the differentials of A and D multiplied by known coefficients. An equation is thus obtained of the form

$$0=a dA+b dD+n,$$

in which a, b, and n are known quantities. Each star furnishes a similar equation; and the equations, being first multiplied respectively by the sine of the star's distance from the point assumed as the apex of the sun's motion, in order to give them all the same weight, are solved by the method of least squares, and the result-

ing values of $d\,A$ and $d\,D$ applied as corrections to the assumed values of A and D. The results are as follows:—the whole of the eighty-one equations give (for 1790) as co-ordinates of the point towards which the sun's motion is directed,

$$Æ=263° 38'{\cdot}0 \pm 5° 14'{\cdot}5\,;\ \text{Dec.}=+37° 15'{\cdot}0 \pm 6° 17'{\cdot}6.$$

But two of the stars compared with Lacaille move in a direction so nearly opposite to that of their motion on the assumed hypothesis, that (in one case especially) a slight error of observation would change the sign of n in the equations of condition. It therefore appears necessary to reject those two stars; and a further reason for rejecting them is, that they are both situated within 8° of the pole, in which position Lacaille's determination of the right ascension is probably not to be depended upon. Setting aside, therefore, the two stars in question, the remaining seventy-nine equations give

$$Æ=256° 51'{\cdot}5 \pm 4° 45'{\cdot}1\,;\ \text{Dec.}=+34° 14'{\cdot}3 \pm 5° 36'{\cdot}2.$$

The author further observes, that one of the stars compared with Bradley's catalogue is also remarkable as appearing to move in a direction nearly opposite to the mean direction of the whole, and that if this star be rejected also on account of the great probability there is that the parallactic motion is in this case concealed by the larger proper motion of the star itself in an opposite direction, the co-ordinates of the solar apex become

$$Æ=259° 47'{\cdot}4 \pm 4° 31'{\cdot}9\,;\ \text{Dec.}=+34° 19'{\cdot}5 \pm 5° 17'{\cdot}7,$$

a result differing less than a degree either in right ascension or declination from the mean, as above stated, of the three previous determinations.